

Revised Fall, 2009

## **ARAPAHOE COMMUNITY COLLEGE SYLLABUS**

**Course Number:** MAT 120 **Title:** Mathematics for Liberal Arts **Credits:** 4

**Instructor:**

**Phone:**

**E-mail:**

**Office Location (if applicable):**

**Office Hours (if applicable):**

### **Important Dates:**

Last day to drop with refund (include date):

Last day to withdraw without refund (include date):

### **Catalog Description:**

This course is designed to develop mathematical and problem-solving skills. Appropriate technological skills are included. Content is selected to highlight connections between mathematics and the society in which we live. Topics include set theory and logic, mathematical modeling, probability and statistical methods, and consumer mathematics. Additional content will include *one* topic in geometry, numeration systems, decision theory, or management science.

This course is one of the **Statewide Guaranteed Transfer** courses. GT-MA1

**Prerequisites:** Successful completion of MAT 099 Intermediate Algebra, formerly MAT 106 Survey of Algebra (a grade of C or better), an Elementary Algebra CPT score of at least 85 or an ACT score of 19..

**Text:** Mathematics All Around by Thomas L. Pirnot, 4<sup>th</sup> Edition, Addison-Wesley, 2010

**Required Course Material:** Text, graph paper and a Texas Instruments TI-83, TI-84 or TI-86 graphing calculator. The math department has a limited number of these calculators available for rent, ask for details. In addition, some calculators are available for use in the Library.

**Please note:** Your Arapahoe.edu **e-mail address** is the official means of communication between you and the college. If you have not done so, please go to the ACC home page to activate your e-mail account

All classes will be **evaluated online** (rather than by using paper and pencil) this year. Please provide feedback for all of your classes

**Grading Criteria:**

**Makeup Policy:**

## **Attendance Policy:**

**Other Information:** Arapahoe Community College provides accommodations to qualified students with disabilities. To request accommodation, contact Disability Services in M2710 or call (303) 797-5937 v/tty.

**Student Success Center for all ACC students:** Peer and professional tutoring in Room M2720 now includes student tutors, math support, and the Writing Center in one location to provide academic assistance for all your classes. Call 303-797-5669 for more information. Please take advantage of this great opportunity to study with experienced tutors and your fellow classmates AND to obtain unlimited access to the math software we will be using in class!

ACC math instructors provide help with concepts, homework, online resources and graphing calculator workshops. Students may watch course related videos and DVDs in the library.

**Online Course Evaluations:** As this course nears completion, you will have the opportunity to complete a confidential evaluation of the class online. Login instructions will be sent to your 'student.cccs.edu' e-mail address. Your feedback is important, and ensures that ACC continues to offer quality instruction that meets your needs. Please take time to complete the survey – I appreciate your feedback.

**E-mail Communication:** Effective 1/20/09 electronic correspondence from ACC employees will go to your student email account *only*. When you activate your account you can forward emails to an e-mail account that you already have. To activate your student e-mail account, go to <http://www.arapahoe.edu> and click on the "Activate Student E-mail" link. Questions? Please call 303-797-5621

**Please refer to the college catalog for policies on:** (Academic Integrity, Plagiarism, Student Code of Conduct, Student Grievance Procedure, etc.)

## **Academic Honesty Statement**

Arapahoe Community College is committed to academic honesty and scholarly integrity. The College can best function and accomplish its mission in an atmosphere of the highest ethical standards. All members of the College community are expected and encouraged to contribute to such an environment by observing all accepted principles of academic honesty. Academic dishonesty includes but is not limited to: **plagiarism, cheating, fabrication, grade tampering, misuse of computers and other electronic technology, and facilitating academic dishonesty.** Those found in violation may also be subject to potential disciplinary sanctions under the Arapahoe Community College Code of Conduct.

**Competencies:** At the end of the semester, a successful completion of this course, a successful student should be able to do the following:

- I. Solve problems involving principles of set theory and logic.
- II. Solve problems involving mathematical modeling.
- III. Solve problems involving probability.
- IV. Solve problems involving statistics.
- V. Solve problems involving consumer mathematics.
- VI. Read, analyze, and apply to new situations, written material related to the study of mathematics.
- VII. Write and speak clearly and logically in presentations and essays about topics related to mathematics.
- VIII. Demonstrate the ability to select and apply contemporary forms of technology to solve problems or compile information in the study of mathematics.
- IX. One of the following competencies is also required.
  - A. Solve problems involving Euclidean geometry
  - B. Solve problems involving varying numeration systems.
  - C. Solve problems involving mathematics of social choice.
  - D. Solve problems involving management science.

**Topical Outline:**

Chapter 1 Problem Solving

- 1.1 Problem Solving
- 1.2 Inductive and Deductive Reasoning
- 1.3 Estimation

Chapter 2 Set Theory

- 2.1 The Language of Sets
- 2.2 Comparing Sets
- 2.3 Set Operations
- 2.4 Survey Problems
- 2.5 Looking Deeper: Infinite Sets

Chapter 3 Logic

- 3.1 Statements, Connectives and Quantifiers
- 3.2 Truth Tables
- 3.3 The Conditional and Biconditional
- 3.4 Verifying Arguments
- 3.5 Using Euler Diagrams to Verify Syllogisms
- 3.6 Looking Deeper: Fuzzy Logic

Chapter 7 Algebraic Models

- 7.1 Linear Equations
- 7.2 Modeling with Linear Equations
- 7.3 Modeling with Quadratic Equations
- 7.4 Exponential Equations and Growth
- 7.5 Proportions and Variations
- 7.6 Functions
- 7.7 Looking Deeper: Dynamical Systems

## Chapter 8 Modeling with Systems of Linear Equations and Inequalities

### 8.1 Systems of Linear Equations

### 8.2 Systems of Linear Inequalities

### 8.3 Looking Deeper: Linear Programming

## Chapter 9 Consumer Mathematics

### 9.1 Percent Changes and Taxes

### 9.2 Interest

### 9.3 Consumer Loans

### 9.4 Annuities

### 9.5 Amortization

### 9.6 Looking Deeper: Annual Percentage Rate

## Chapter 14 Probability

### 14.1 The Basis of Probability Theory

### 14.2 Complements and Unions of Events

### 14.3 Conditional Probability and Intersections of Events

### 14.4 Expected Value

### 14.5 Looking Deeper: Binomial Experiments

## Chapter 15 Statistics

### 15.1 Organizing and Visualizing Data

### 15.2 Measures of Central Tendency

### 15.3 Measures of Dispersion

### 15.4 The Normal Distribution

### 15.5 Looking Deeper: Linear Correlation

At least one of the following chapters is also required:

## Chapter 5 Numeration Systems

### 5.1 The Evolution of Numeration Systems

### 5.2 Place Value Systems

### 5.3 Calculating in Other Bases

### 5.4 Looking Deeper: Modular Systems

## Chapter 6 Number Theory and the Real Number System

### 6.1 Number Theory

### 6.2 The Integers

### 6.3 The Rational Numbers

### 6.4 The Real Number System

### 6.5 Exponents and Scientific Notation

### 6.6 Looking Deeper: Sequences

## Chapter 10 Geometry

### 10.1 Lines, Angles, and Circles

### 10.2 Polygons

### 10.3 Perimeter and Area

### 10.4 Volume and Surface Area

### 10.5 The Metric System and Dimensional Analysis

### 10.6 The Geometric System and Tessellations

### 10.7 Looking Deeper: Fractals

## Chapter 11 Apportionment

### 11.1 Understanding Apportionment

### 11.2 The Huntington-Hill Apportionment Principle

### 11.3 Applications of the Apportionment Principle

### 11.4 Other Paradoxes and Apportionment Methods

- 11.5 Looking Deeper: Fair Division
- Chapter 12 Voting
- 12.1 Voting Methods
- 12.2 Defects in Voting Methods
- 12.3 Weighted Voting Systems
- 12.4 Looking Deeper: The Shapley-Shubik Index

**Outline View:**

- I. Set Theory and Logic
  - A. Notation and Terminology
  - B. Subset
  - C. Venn Diagram
  - D. Union, Intersection & Complement
  - E. Applications
  - F. Inductive & Deductive
  - G. Conjunction, Disjunction, & Negation
  - H. Set Operations
    - I. Logic: Conditional & Biconditional
    - J. Logic: Converse, Inverse, & Contrapositive
  - K. Truth Tables
- II. Mathematical Modeling
  - A. Function, Domain & Range
  - B. Relationship
  - C. Linear Graphs
  - D. Linear Programming
  - E. Linear Inequalities
  - F. Quadratics
  - G. Quadratic Applications
  - H. Exponentials
    - I. Exponential Applications
    - J. (Optional) Logarithms
    - K. (Optional) Logarithmic Applications
- III. Probability
  - A. Sample Space
  - B. Probability
  - C. Theoretical & Experimental
  - D. Outcome
  - E. Permutation & Combination
  - F. Counting Rules
  - G. Union & Intersection
  - H. Odds & Expected Value
- IV. Statistics
  - A. Descriptive & Inferential
  - B. Graphical Presentations
  - C. Population & Sample
  - D. Mean, Median & Mode
  - E. Range, Variance & Standard Deviation
  - F. Normal Distribution

- G. Probability & Percent
- V. Consumer Mathematics
  - A. Simple Interest
  - B. (Optional) Credit Card Finance Charge
  - C. Compound Interest
  - D. Effective Rate
  - E. Inflation
  - F. Doubling
  - G. Annuities
  - H. Future & Present Value
  - I. Payment Size
  - J. Amortization Schedule
- VI. ONE OF THE FOLLOWING TOPICS IS ALSO REQUIRED.**
- VII. Euclidean Geometry.
  - A. Point, line, & plane
  - B. Angles
  - C. Polygon
  - D. Fibonacci Sequence
  - E. Applications
  - F. Golden Ratio
  - G. Choose one of the following topics.
    - 1. Fractal Geometry
      - a. Fractal
      - b. Applications
      - c. Fractal Construction
    - 2. Tessalations.
      - a. Tessalation
      - b. Regular Polygons that Tessalate a Plane
      - c. Tessalate a small area.
      - d. Applications
- VIII. Numeration Systems
  - A. Counting Numbers - Different Cultures
  - B. Conversions
  - C. Add & Subtract – Different Cultures
  - D. Origin of Our System
  - E. Different Bases
  - F. Calculating Devices
  - G. Binary System
- IX. Mathematics of Social Choice
  - A. Voting Systems
  - B. Voting Methods - Election Results
  - C. Logistics of Voting Systems
  - D. Weighted Voting Systems
  - E. Banzhaf Power Index
  - F. Apportionment Methods
  - G. Flaws & Paradoxes - Apportionment Methods
- X. Management Science
  - A. Euler circuit
  - B. Algorithm

- C. Hamiltonian Cycle
- D. Heuristic Algorithm - Traveling Salesman Problem (TSP)
- E. Networking Applications
- F. Minimum Spanning Tree
- G. Network Linking
- H. Flowchart
- I. Scheduling Conditions

The **safety and security** of all our students, faculty, staff and visitors is of the utmost importance to the Campus Police Department. We rely on each of you to be an additional set of ears and eyes to help maintain campus safety. Please be diligent in your efforts to report suspicious or unusual behavior or circumstances to the Campus Police Department. Trust your instincts when something doesn't look, seem or feel right and tell someone. The **Campus Police** can be reached at **303-797-5800** or in M2600 on the second floor behind Information Central. Additional safety information can be found on the website at <http://www.arapahoe.edu/studentsvcs/campuspolice/index.html>

#### **Contact Information for Learning Support Services**

<b>Library</b>	<b>M2500 303-797-5090</b>
<b>Technical Support</b>	<b>303-797-5700 x3199</b>
<b>Student Support Services – Peer and Professional Tutoring</b>	<b>M2720 303-797-5669</b>
<b>Advising/Counseling</b>	<b>M2010 303-797-5651</b>
<b>Instructional Testing Center</b>	<b>M2280 303-797-5993</b>
<b>Bookstore</b>	<b>M1200 303-797-5676</b>
<b>Computer Lab</b>	<b>M1650 303-797-5907</b>
<b>Career Center</b>	<b>M2025 303-797-5805</b>
<b>eLearning</b>	<b>M1650 303-797-5700 x6700</b>